Welcome

To My Talk

Progress in Disaster Science for Achieving the UN Sustainable Developments Goals (SDGs)

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Lecturer

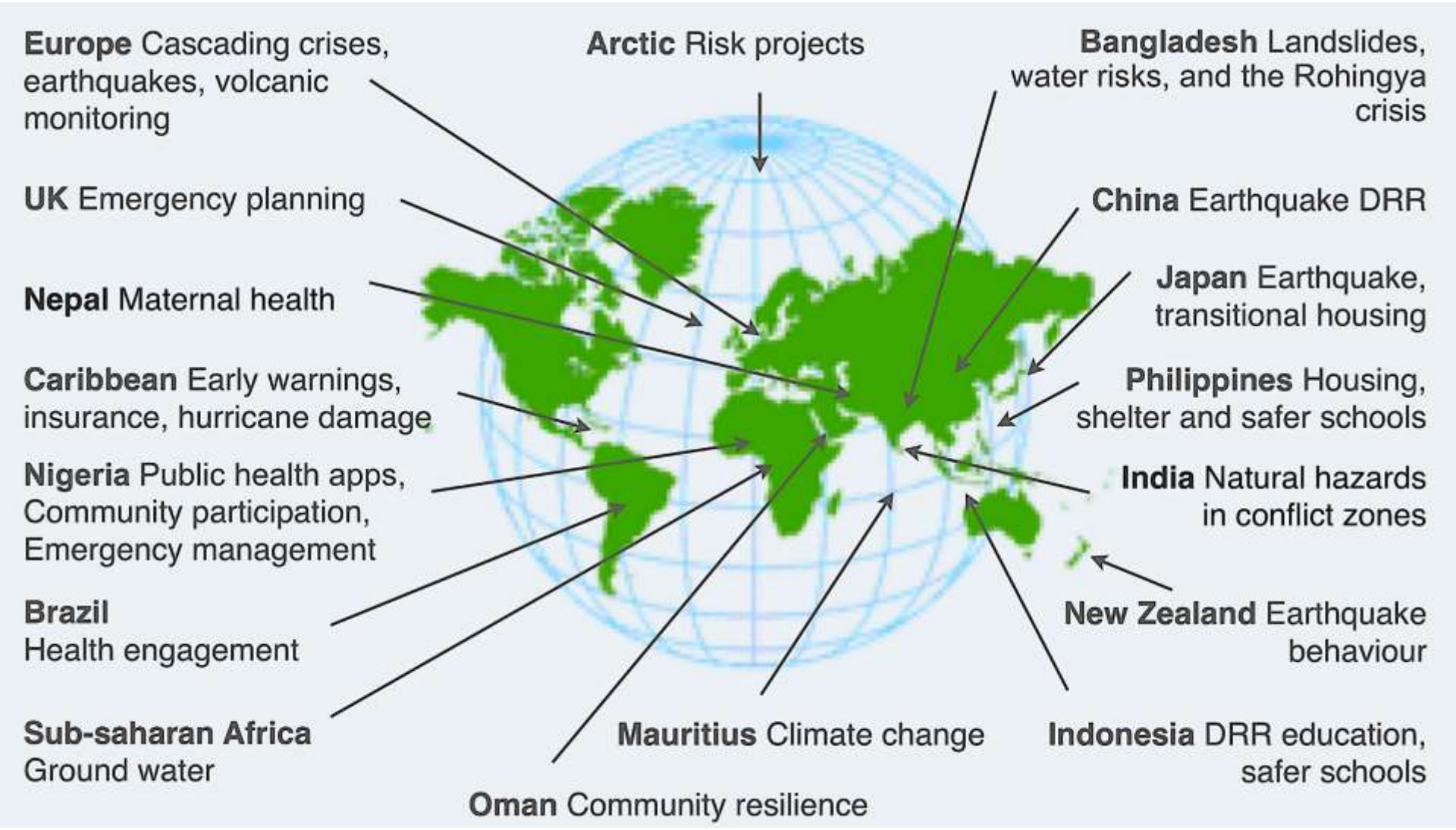
Institute for Risk & Disaster Reduction (IRDR)

University College London (UCL), UK

23 July 2019

About UCL – University College London

UCL


Europe Cascading crises, earthquakes, volcanic monitoring
Arctic Risk projects
Bangladesh Landslides, water risks, and the Rohingya crisis
UK Emergency planning
China Earthquake DRR
Nepal Maternal health
Japan Earthquake, transitional housing
Caribbean Early warnings, insurance, hurricane damage
Philippines Housing, shelter and safer schools
Nigeria Public health apps, Community participation, Emergency management
India Natural hazards in conflict zones
Brazil Health engagement
New Zealand Earthquake behaviour
Sub-saharan Africa Ground water
Mauritius Climate change
Indonesia DRR education, safer schools
Oman Community resilience

INSTITUTE FOR RISK AND DISASTER REDUCTION

UCL

Masters Programmes

- Risk, Disaster and Resilience MSc
- Risk and Disaster Science MSc
  (Data Science and Management Pathway)
- Space Risk and Disaster Reduction MSc
- Risk and Disaster Reduction MRes

@ UCLIRDR

Duration: Full-time 1 year Part-time 2 years

2016 Amatrice Earthquake, EEFIT mission

Contact us

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Web: https://www.ucl.ac.uk/risk-disaster-reduction/

Developing leaders and experts in risk and disaster reduction

IRDR

UN Sustainable Development Goals (SDGs)

1.5 By 2030, **build the resilience of the poor and those in vulnerable situations** and reduce their exposure and vulnerability to **climate-related extreme events** and other **economic, social and environmental shocks and disasters**.

11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product **caused by disasters**, including water-related disasters, with a focus on protecting the **poor and people in vulnerable situations**.

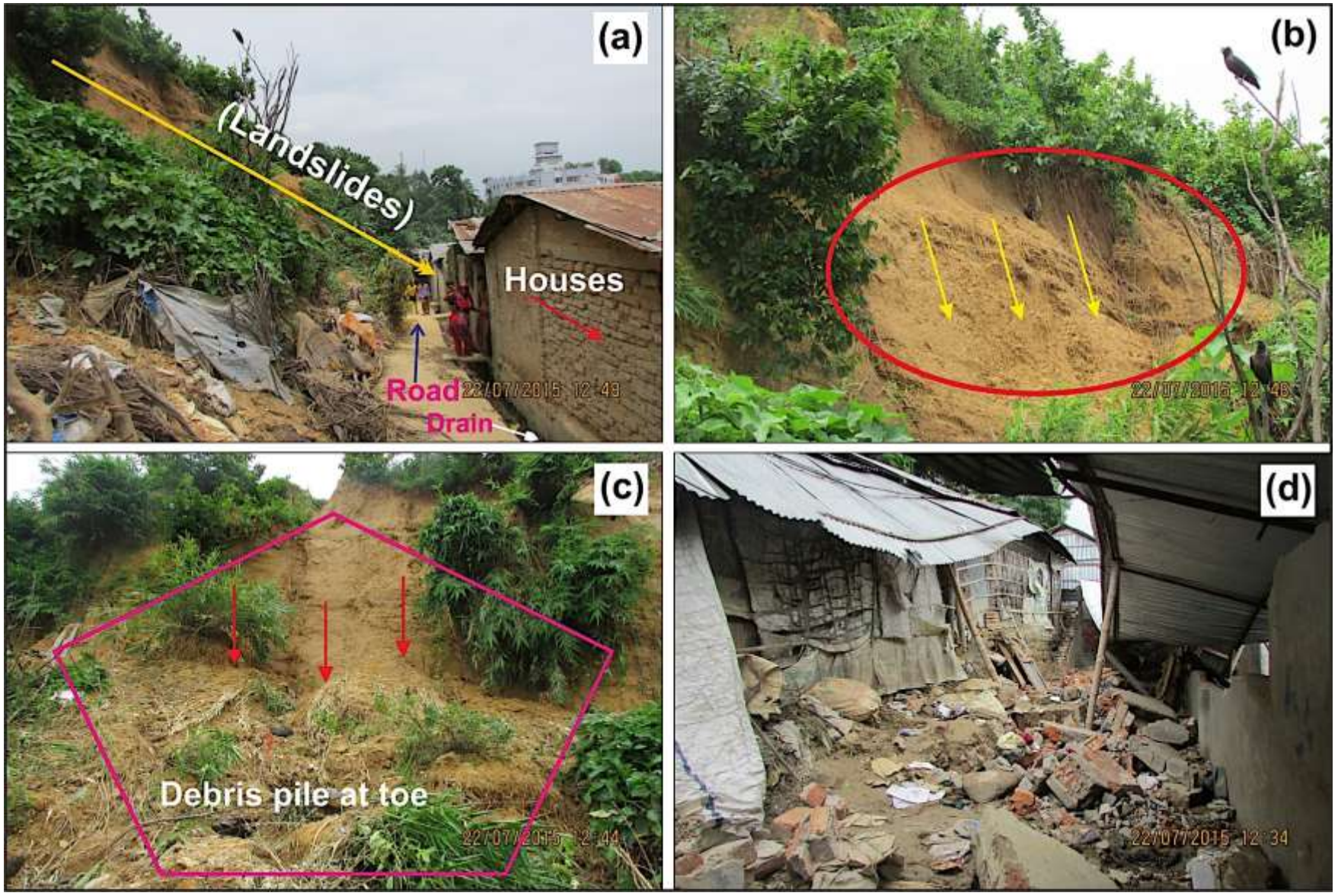
UN Sustainable Development Goals (SDGs)

10.2 By 2030, empower and promote the **social, economic and political inclusion** of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.

11.B By 2020, substantially increase the number of **cities and human settlements** adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to **climate change, resilience to disasters**, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, **holistic disaster risk management** at all levels.

Landslide Work

Landslides



Hill Cutting

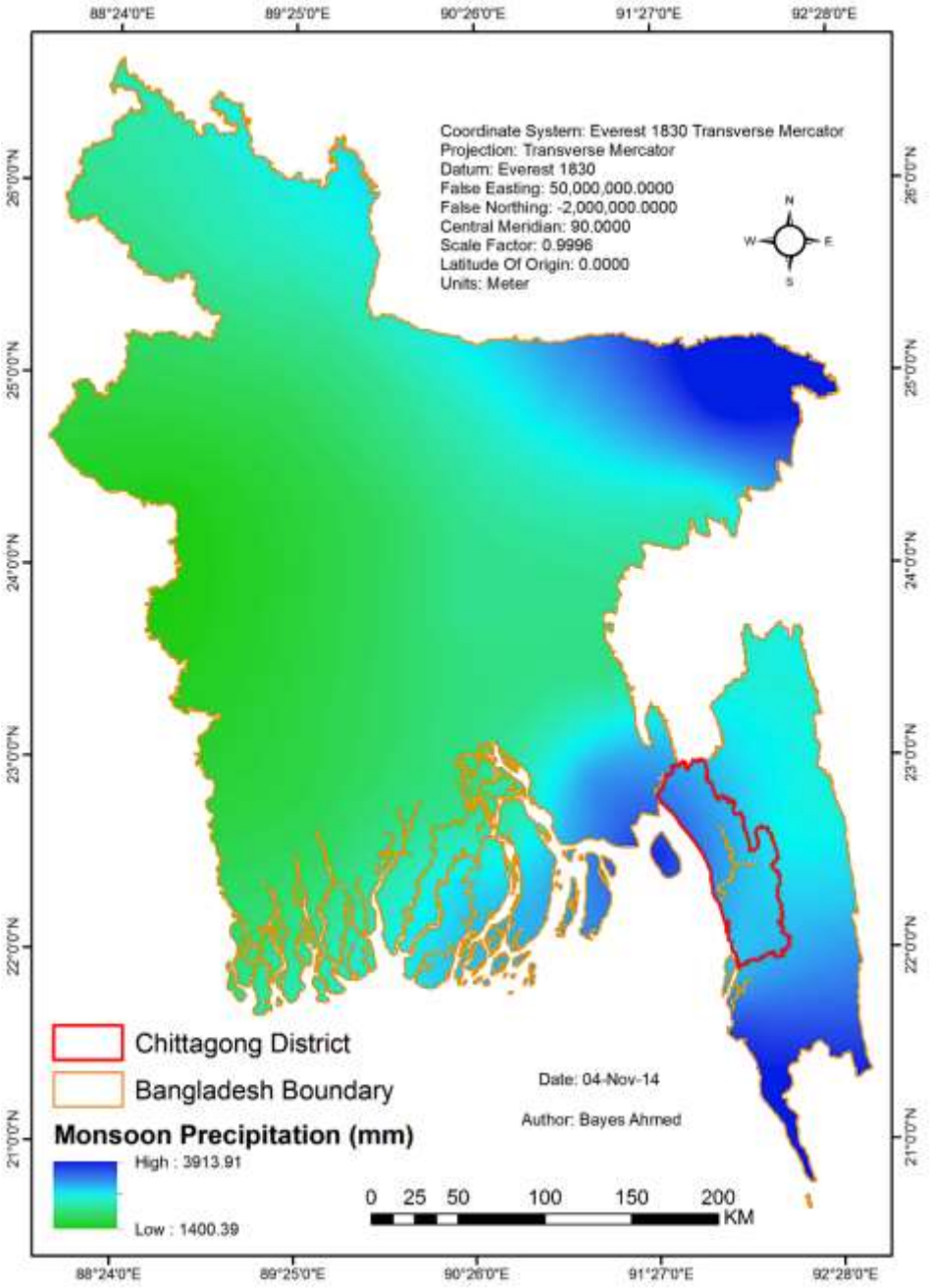
2017 Rohingya Exodus (1.2 million refugees)


Chittagong
(a)
Kutupalong Camp
(b)
Kutubdia
Landslideprone Area
Hill Cut Area
Flood Zone
92°0'0"E
N
0 5 10 20 Km
Naf River
Bangladesh Location in Globe
92°30'0"E

Landslide Disasters

Date	Location of Landslides	Rainfall Sequence	Consequences
27 July 2015	South Baharchharha area, Cox's Bazar	682 mm rainfall in 6 days	5 fatalities, and 4 houses buried
13 June 2017	All five hill districts	300 mm rainfall in 24 hours	159 killed and 88 injured
25 July 2017	Sadar and Ramu Upazila, Cox's Bazar	677 mm rainfall in 6 days	5 killed and 5 injured
11 June 2018	Ukhia Rohingya camps	459 mm rainfall in 4 days	1 killed and 500 injured
12 June 2018	Maheshkhali Upazila		1 killed
25 July 2018	Miar Ghona, CBM and Dokkhin Mithachori, Ramu Upazila	228 mm rainfall in 24 hours	5 killed

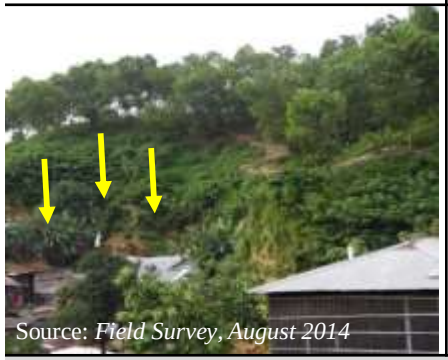
Activities

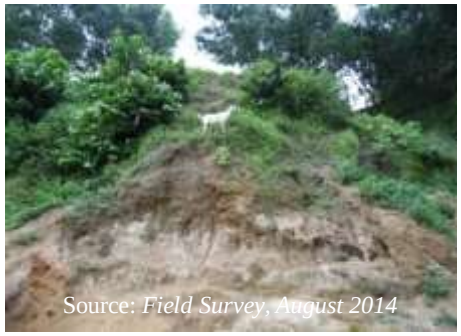


nformation

ide ID :05
ide Location: Tanker Pahar, Moti Jharna
nates: 22° 20'54.27''N, 91° 48'51.60''E

Datum: WGS 1984
Elevation (m): 41.18
Area of Displaced Mass (sqm): 331.84
Rainfall: Unknown


Source: *Field Survey, August 2014*


Source: *Field Survey, August 2014*

ide Mechanism

Movement: Slide
Active, Reactivated, Suspended
ution: Advancing

Style: Single
Water Content: Moist
Material: Soil/Earth

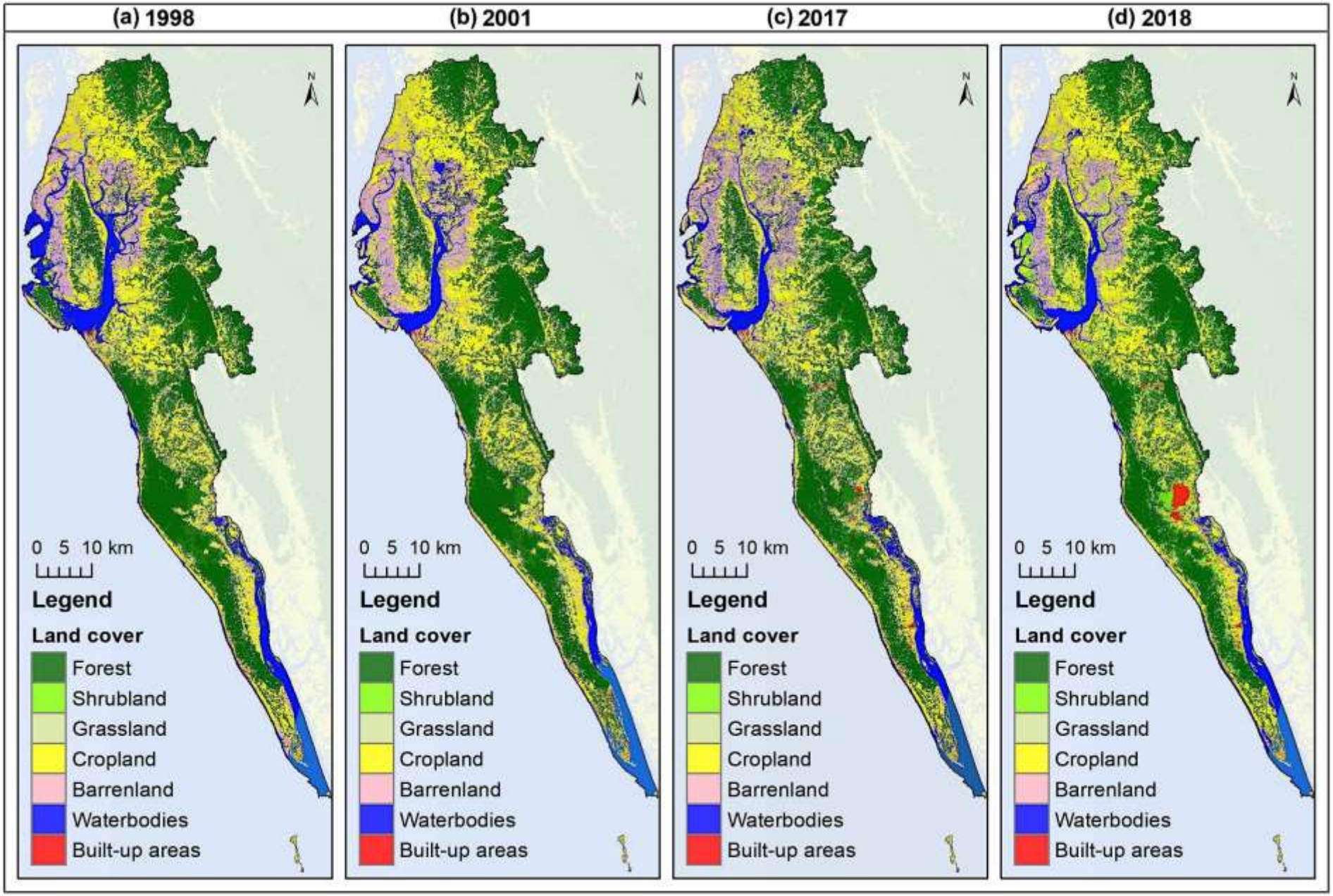
Cover/Use Type (%):
eous vegetation is the Primary land cover of Tanker Pahar. Forest/ woodland type is also n this hill.

of Movement:
tting is the major issue that caused landslide in this area and intense rainfall acted as a ng factor for landslide.

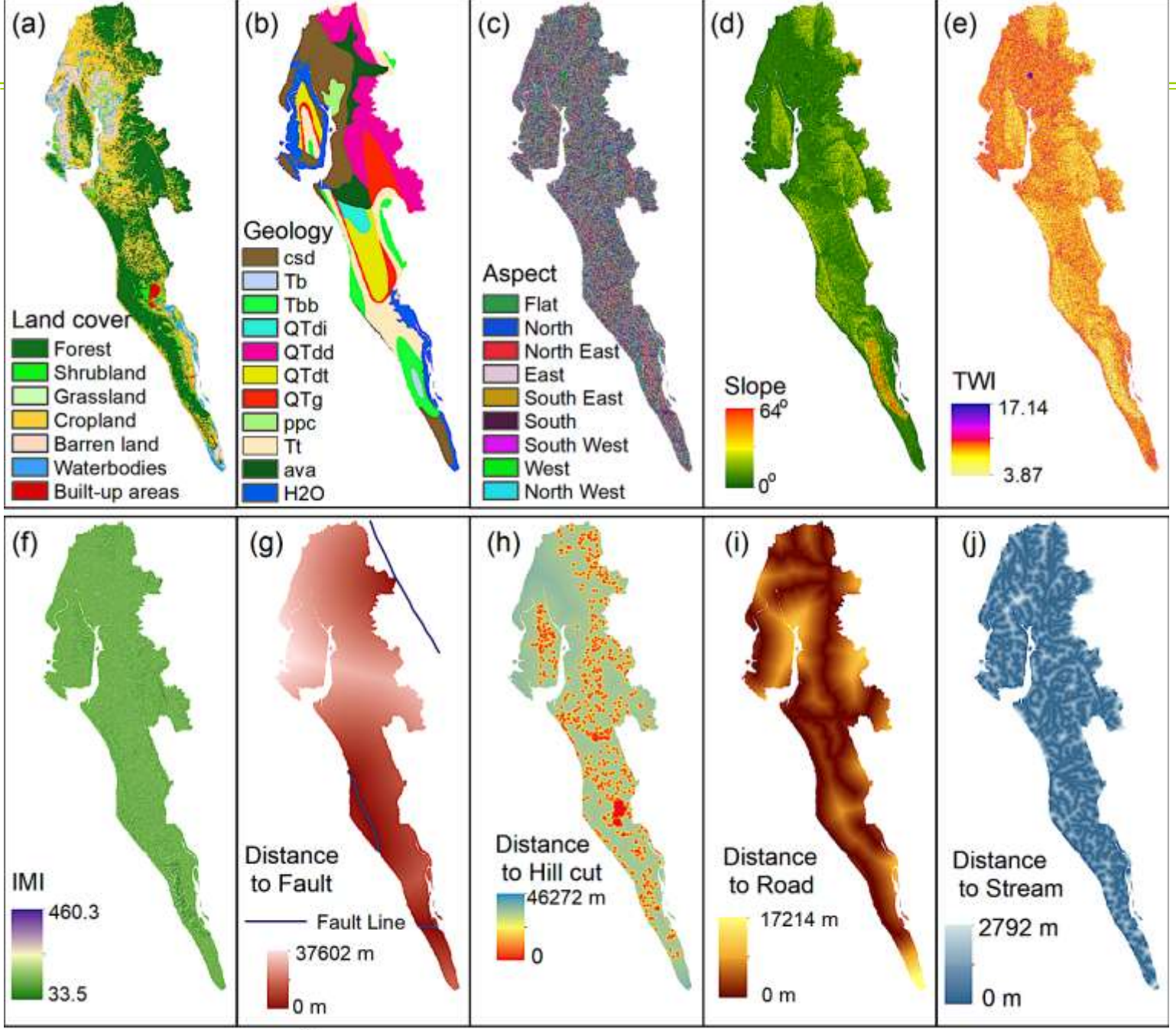
lide History and Future Risk of Landslide

de in this site occurred in 1982, 1989,1991,1994,1996 and 2013. 10 houses got damaged and 22 people died due to landslide at different periods. Utility facilities were highly damaged in ident. Economic activities were hampered so does the social life of people. Environment has und to be severely damaged. Still there are many houses located at the down slope of the hill. this site has been found to be sandy. The escapement slope is found to be near vertical. The nass is a part of upper portion. Vertical Slope characteristics can be considered as a ting factor to future landslide for this hill. Settlements located at the down slope of this hill huge risk of massive landslide. The risk is high (Field survey, August 2014).

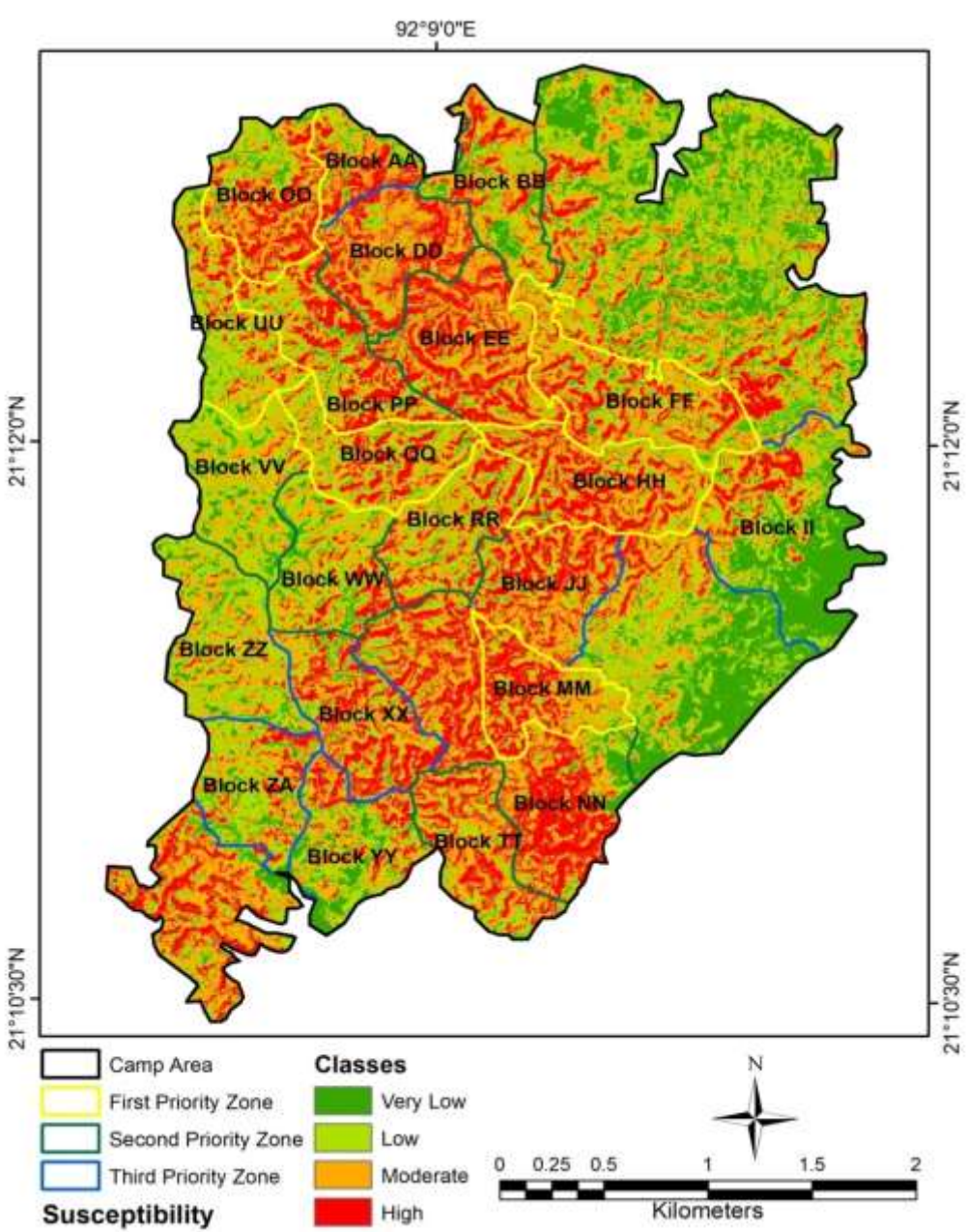
Land Cover Mapping

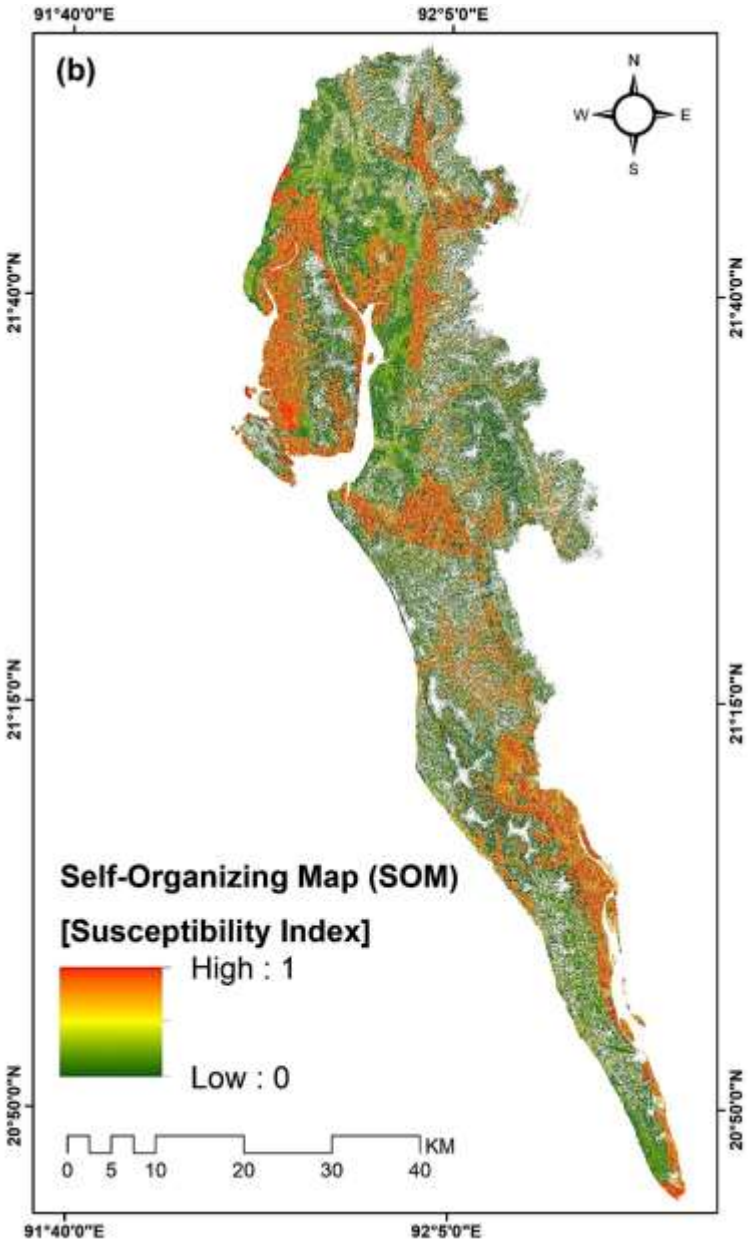


Factor Maps


(a)
Land cover
Forest
Shrubland
Grassland
Cropland
Barren land
Waterbodies
Built-up areas
(b)
Geology
csd
Tb
Tbb
QTdi
QTdd
QTdt
QTg
ppc
Tt
ava
H2O
(c)
Aspect
Flat
North
North East
East
South East
South
South West
West
North West
(d)
Slope
64°
0°
(e)
TWI
17.14
3.87
(f)
IMI
460.3
33.5
(g)
Distance to Fault
Fault Line
37602 m
0 m
(h)
Distance to Hill cut
46272 m
0
(i)
Distance to Road
17214 m
0 m
(j)
Distance to Stream
2792 m
0 m
N
0
25
50
100 Km

Landslide Susceptibility Mapping (LSM)





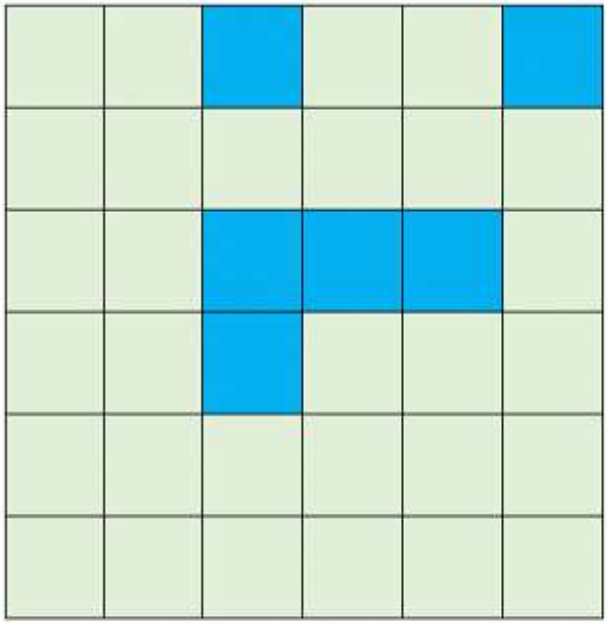
Early Warning System

Landslide Hazard Matrix	Zone 2 (Low LSM)	Zone 3 (Medium LSM)	Zone 4 (High LSM)
R1 (Low Rainfall)			
R2 (Medium Rainfall)			
R3 (High Rainfall)			

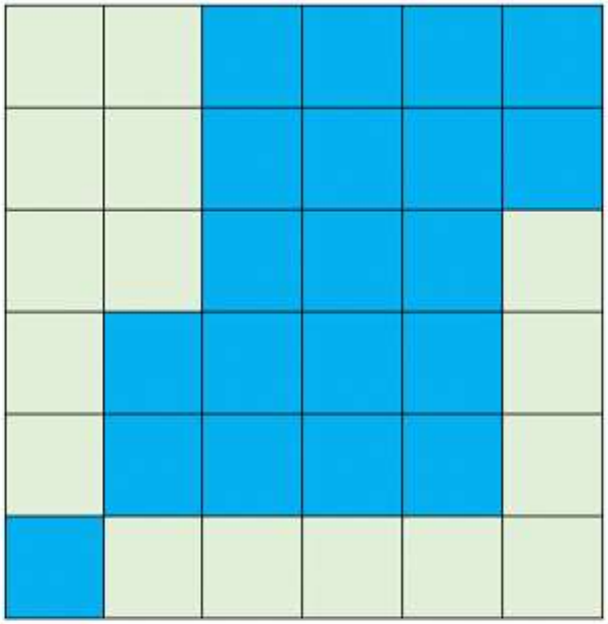
No-Warning State | Warning State

A hazard class (no warning vs. warning state) is assigned based on the assumption that **the higher the susceptibility, the lower the rainfall**.

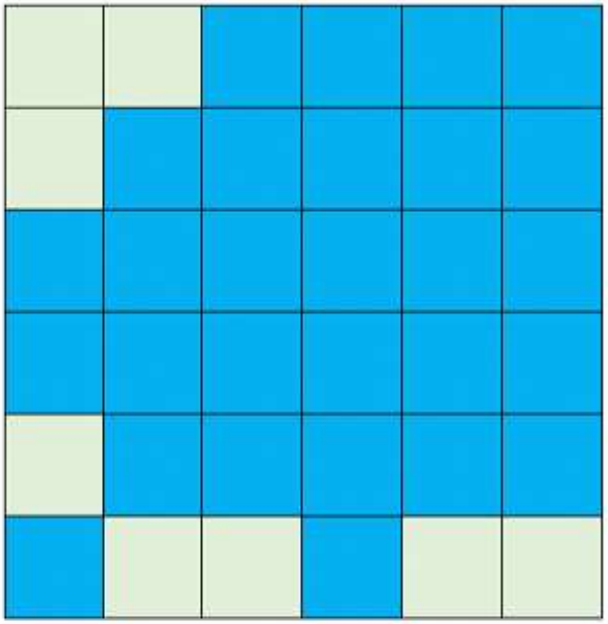
Early Warning System



(a) Scenario 1: Low Rainfall (R1) [Zone 4] = 6 cells affected



(b) Scenario 2: Medium Rainfall (R2) [Zones 4+3] = 20 cells affected

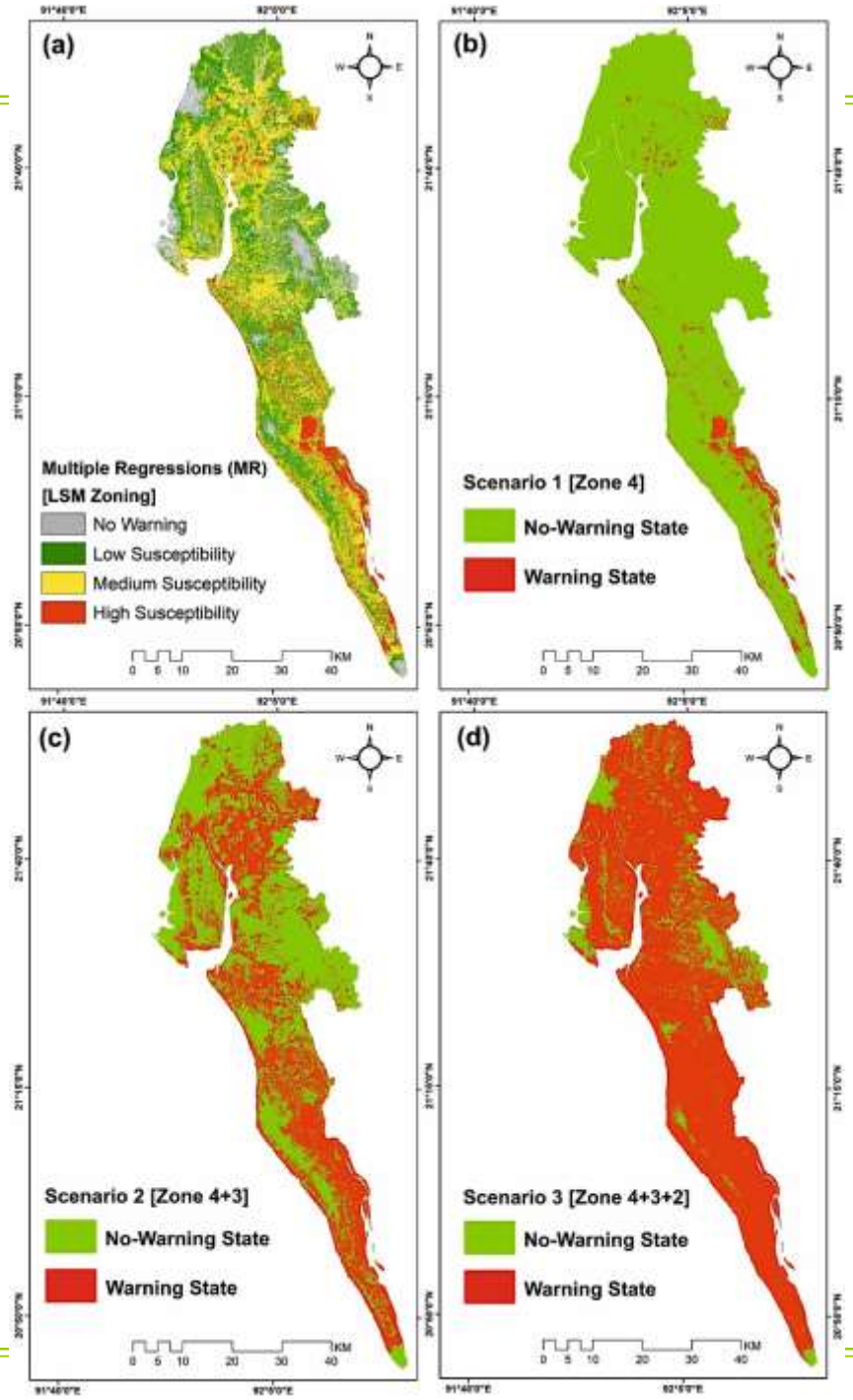


(c) Scenario 3: High Rainfall (R3) [Zones 4+3+2] = 28 cells affected

Early Warning System

0	35	210	151	142	226
41	67	180	129	111	167
98	105	255	249	250	87
66	170	222	180	200	99
38	119	178	159	199	80
186	20	17	77	45	20

Early Warning System

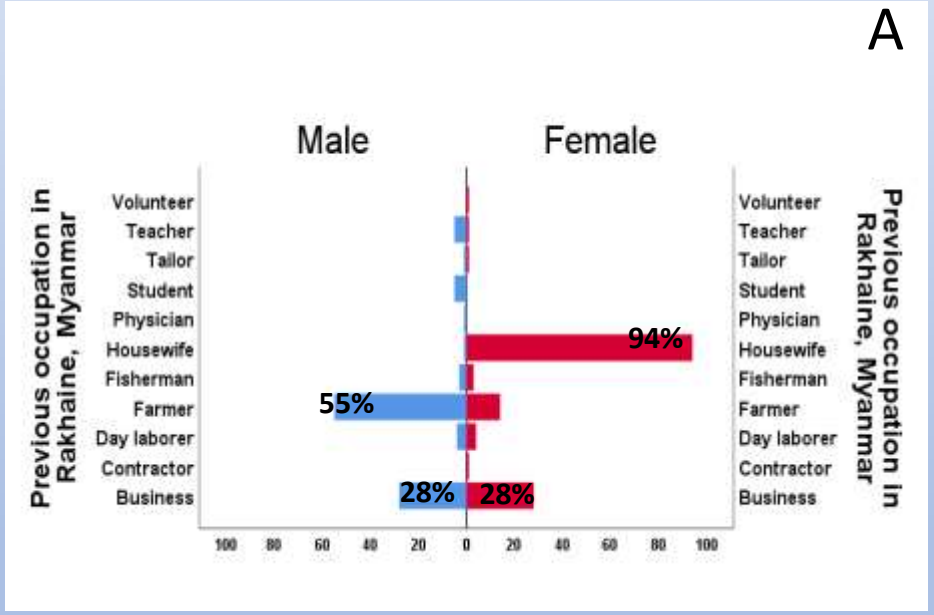


URL: www.landslidebd.com

Rainfall Amount (mm) [Consecutive 5 Days Cumulative]
Low Rainfall (R1) = 95 – 220
Medium Rainfall (R2) = 221 – 345
High Rainfall (R3) > 345
No Warning

RESULTS: Variation of Employment Status

Refugees' restricted mobility is the basic hindrance towards employment which ultimately limits the ability to cope with natural hazards.



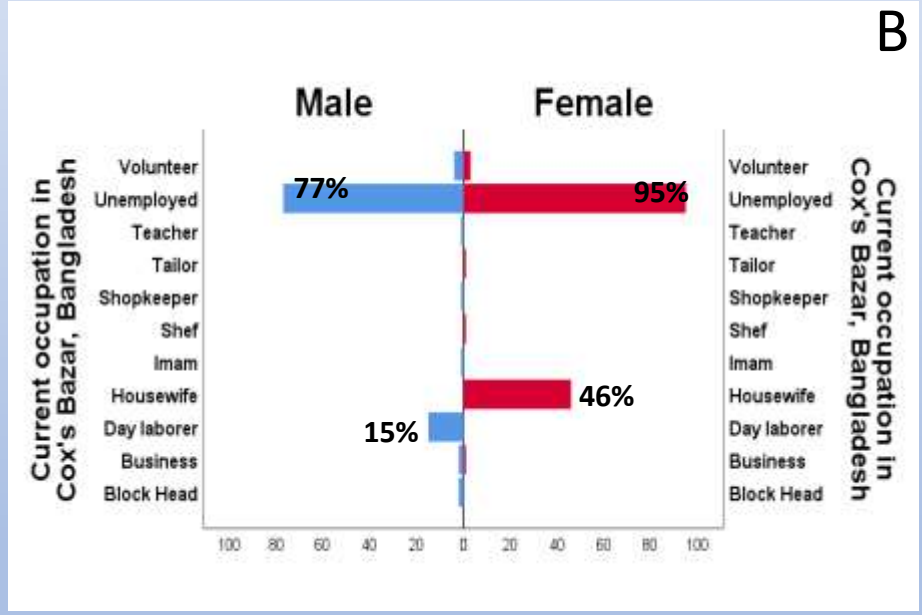
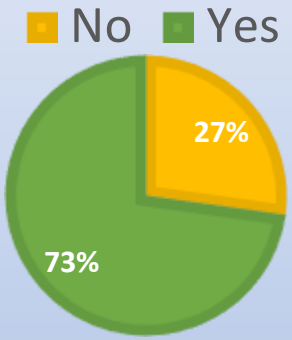
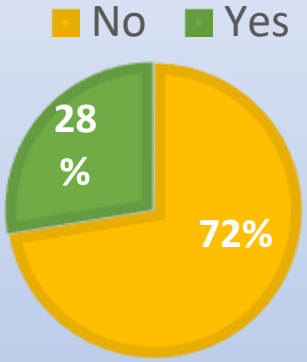


Figure 1. Occupational variation among Rohingyas in Rakhine (A) and Cox's Bazar (B).

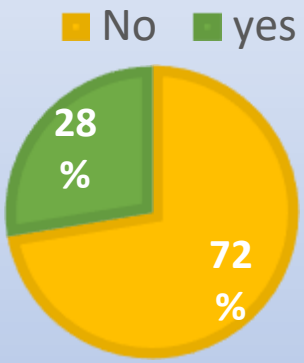
RESULTS: Adopted resilient strategies at pre-disaster period



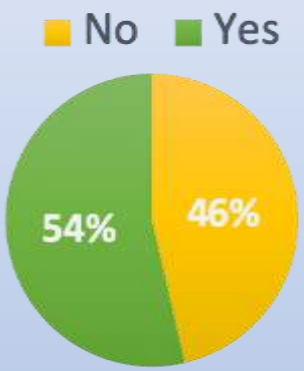
Have you received **early warning message** about upcoming disaster in the camp?



Do you **store dried food** in an advance before disaster



Do you **store medicine** in an advance before disaster?



Do you have any **storage space (wooden-framed loft or shelf)** above the ground where you can keep your **Non-food items** protected in case of water logging?

RESULTS: Adopted resilient strategies at pre-disaster period

- The probability for the **literates is 4.032 times higher compared** to their illiterate counterparts in **storing dried foods** before disaster.

- Similarly, **literates exhibit 19.5 times higher** probability compared to their illiterate counterparts in **storing medicines** before disaster.

Kashmir – India

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr

Indigenous mountain people's risk perception to environmental hazards in border conflict areas

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ARTICLE INFO

Keywords:
Participatory rural appraisal
Hindu Kush Himalaya
War
Landslides
Line of control
India

ABSTRACT

This study aims to understand community risk perception to environmental hazards in a border conflict zone context in high-mountain areas. Participatory rural appraisal (PRA) tools were applied by the social science team. The results were validated with a hazard map prepared by a separate team comprised of geologists. Turtuk, the northernmost village in Ladakh, India located near the line of control with Pakistan was undertaken as a case study. Turtuk represents a high mountain indigenous rural community which has experienced several catastrophic disasters (flash flooding and landslides in 2010, 2014, and 2015) and territorial armed conflicts (wars in 1971 and 1999 with Pakistan) in recent times. The villagers were able to identify various environmental hazards and associated risk zones through participatory timeline diagram, and hazard and dream mapping exercises. The PRA maps matched the geological hazard map of Turtuk, demonstrating that community people

EEFIT Mission in Ecuador

THE MUISNE, ECUADOR EARTHQUAKE OF 16 APRIL 2016

A FIELD REPORT BY EEFIT

Reconstruction Strategy

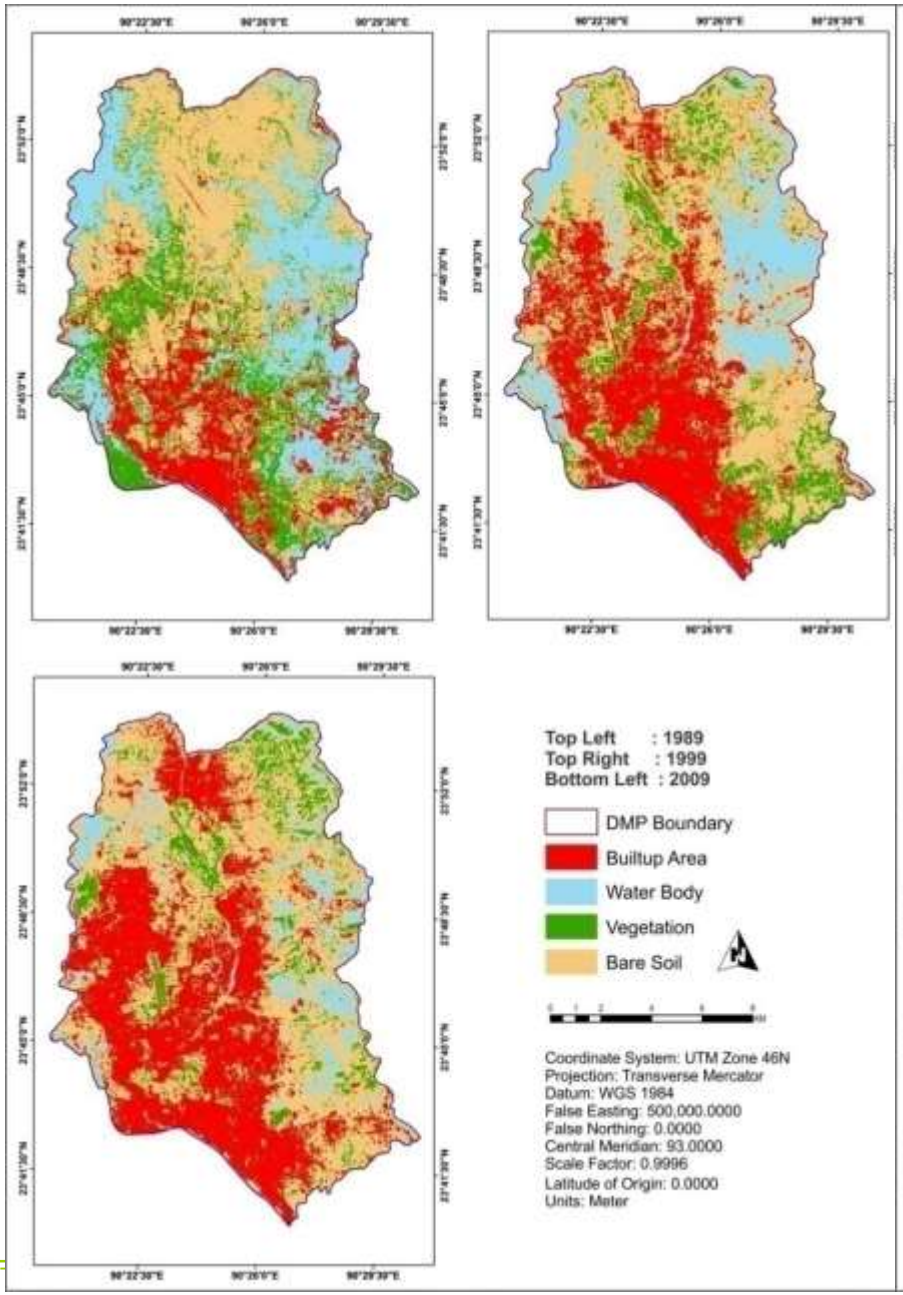
A strong correlation ($\chi^2 = 0.006$) was calculated for building materials before and after the earthquakes (Table 8-20). Some of the victims from the RC-timber/bamboo houses wanted to relocate in houses predominantly made of timber (21%) or bamboo (13%).

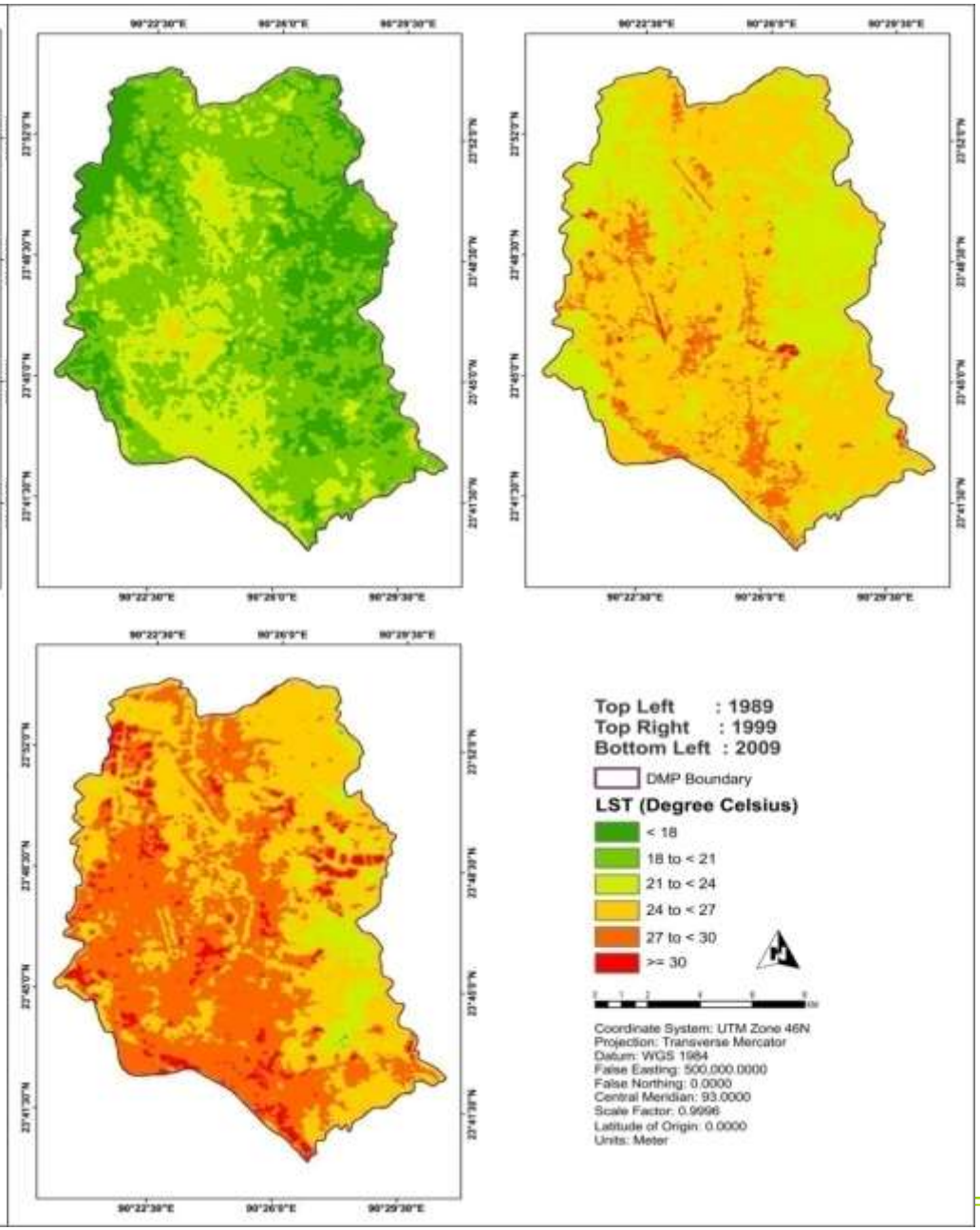
Table 8-20 Building material before and after scenario.

Building Material (Before)	Building Material (After)					Total
	Concrete	Timber	Bamboo	Timber & Brick Mix	Steel Structure	
RC	8.7%	19.1%	0.9%	2.6%		31.3%
Timber/ Bamboo	7.0%	13.0%	2.6%	0.9%		23.5%
RC-Timber/ Bamboo	5.2%	20.9%	13.0%	1.7%	4.3%	45.2%
Total	20.9%	53.0%	16.5%	5.2%	4.3%	100.0%

Number of floors (before)		Number of floors (after)		Total
		1	2	
	1	44.0%	2.6%	46.6%
	2	37.1%	7.8%	44.8%
	3	1.7%	1.7%	3.4%
	4	3.4%		3.4%
	5	1.7%		1.7%
Total		87.9%	12.1%	100.0%

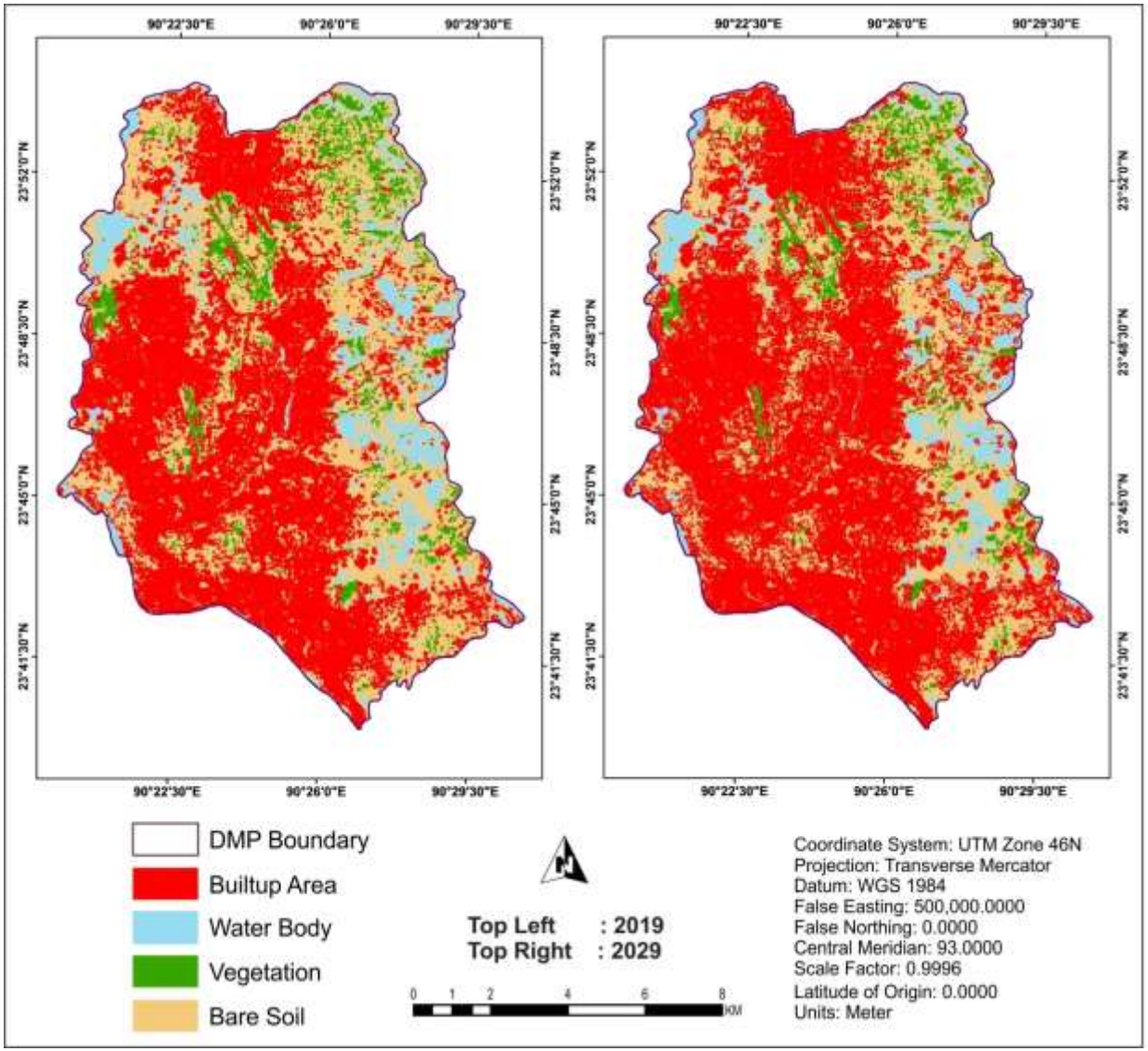
Spatial Distribution of Land Surface Temperature (LST)





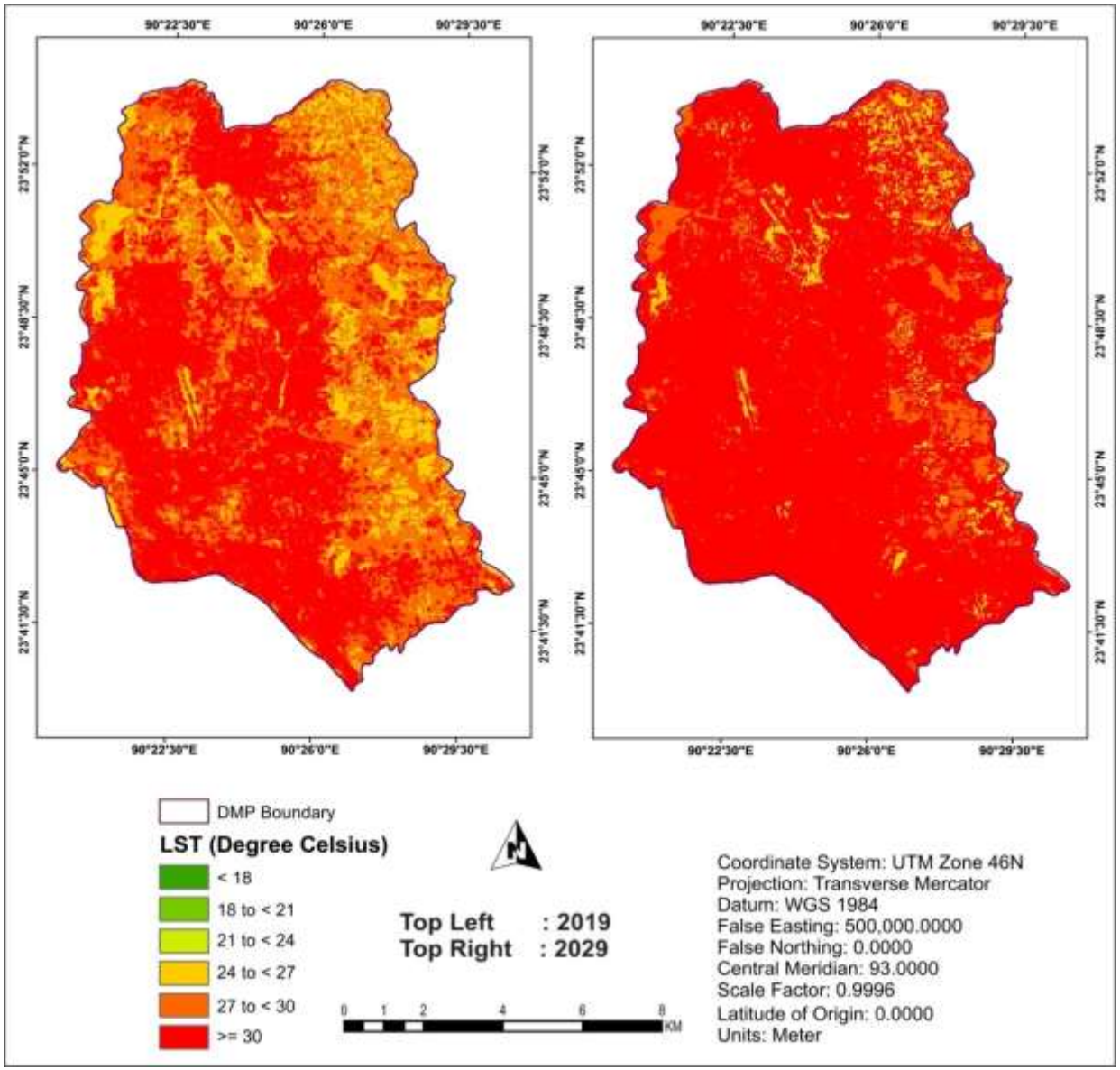
Simulated Land Cover Dynamics (MLP_Markov Model)

Approximately **49%** and **57%** of DMP area will be converted into '**Built-up Area**' land cover type in 2019 and 2029, respectively



Simulating the Future LST Maps (2019 and 2029)

Approximately **56%** and **87%** of DMP area will fall in the **Highest Temperature Zone (>= 30ºC)** in 2019 and 2029, respectively



INSPIRE: Indonesia School Programme to Increase Resilience

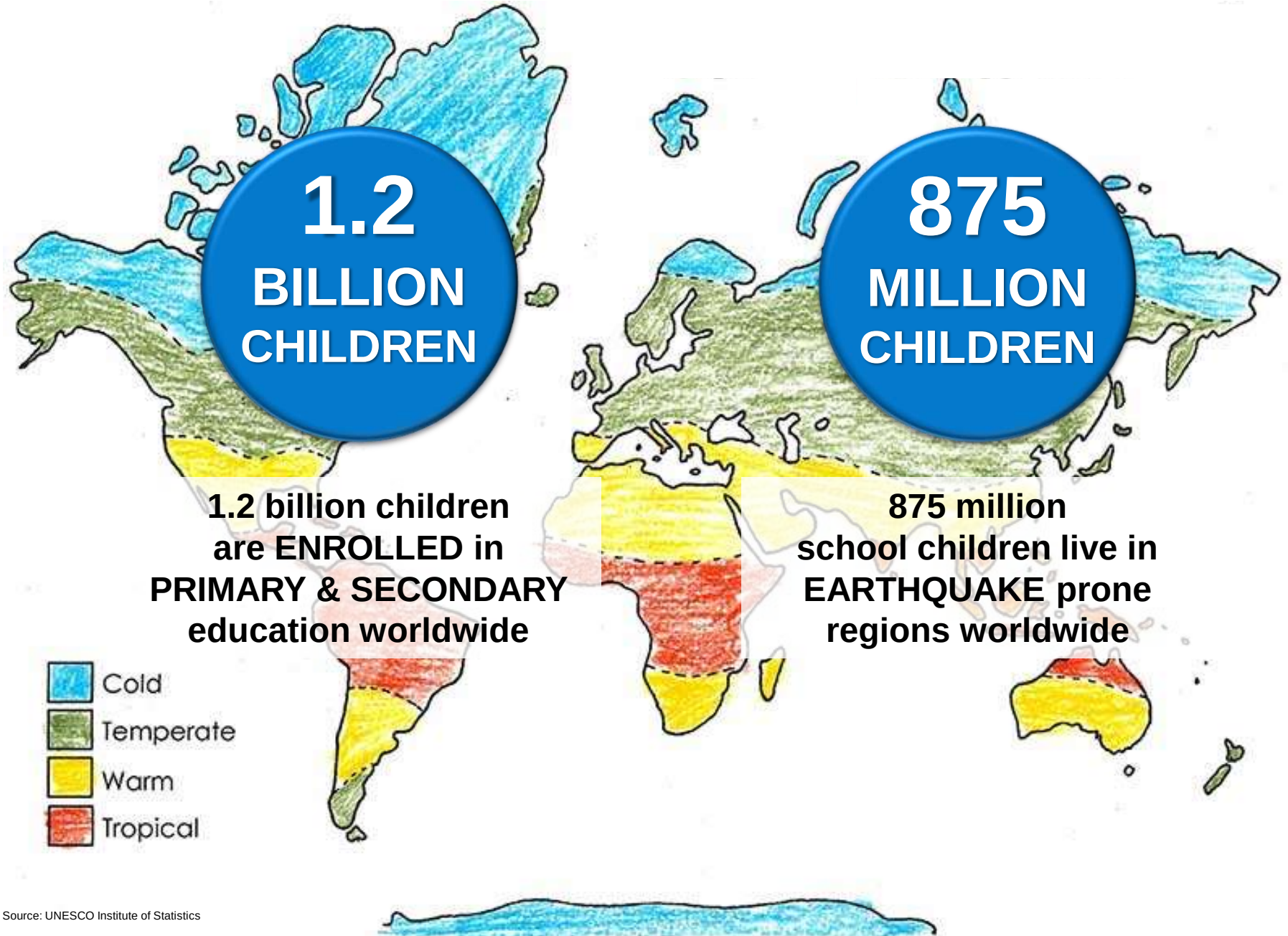
Why Schools ?

1.2
BILLION
CHILDREN

875
MILLION
CHILDREN

1.2 billion children are ENROLLED in PRIMARY & SECONDARY education worldwide

875 million school children live in EARTHQUAKE prone regions worldwide



Source: UNESCO Institute of Statistics

Why Indonesia ?

UCL

Indonesia Natural Hazard Risk Map

Earthquake Intensity

For 20% probability of exceedance in 50 years

Modified Mercalli Shaking Scale

- Weak - Light
- Moderate - Strong
- Very Strong
- Severe - Violent
- Extreme

Tropical Storm Intensity

For 10% probability of exceedance in 10 years

Saffir-Simpson Scale

- One: 118-153 km/h
- Two: 154-177 km/h
- Three: 178-209 km/h
- Four: 210-249 km/h
- Five: 250+ km/h

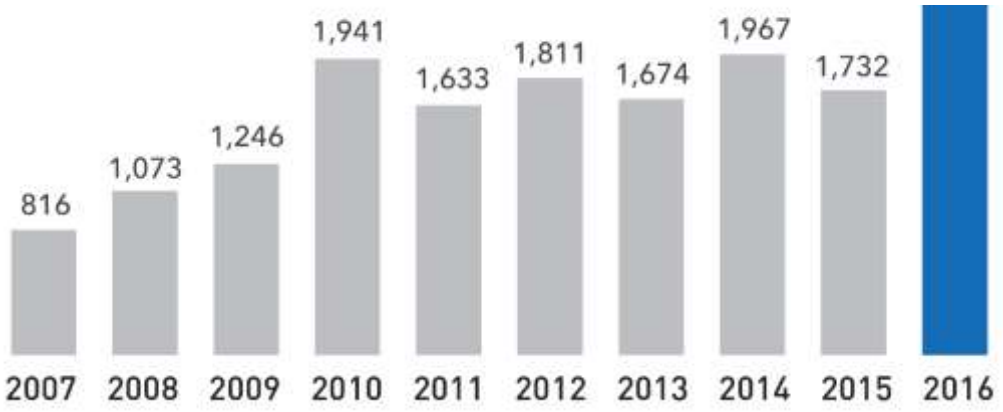
United Nation Office for the Coordination of Humanitarian Affairs (OCHA) [March 2011]

Disaster Risk Index 2017

Indonesia, an archipelago of more than **17,000 islands**, is situated in the '**ring of fire**'. It is vulnerable to floods, earthquakes and tsunamis, and is home to **77 active volcanoes**. On average, **650,000 people are annually affected** by disasters.

Frequency of Natural Disaster Events

650,000 people are annually affected by disasters in Indonesia.



Source: United Nations Office for the Coordination of Humanitarian Affairs (2018)

Why Indonesia ?

source: busy.org

Why Schools ?

Year	Event	No. of schools effected
Dec. 2004	**Sumatra Tsunami**	>2,000 (damaged)
May 2006	**Yogyakarta Earthquake** (M_w 6.4)	>3,000 (collapsed)
Sep. 2009	**Padang Earthquake** (M_w 7.6)	>1,000 (damaged)

Damage of Dec. 2004 Sumatra Tsunami – Indonesia
(newstatesman.com)

INSPIRE partners

UCL

UCL RDR

Tsunami and Disaster Mitigation Research Center
TDMRC

UNIVERSITAS SYIAH KUALA

PANCACITA
Dinas Pendidikan Aceh

Sekolah Aman Bencana

(Provincial) Education Authority

NGO/Indonesia

AIR

MAIPARK

RG
RESCUE GLOBAL
Disaster Risk Reduction and Response

Risk Modelling/UK

Insurance/Indonesia

NGO/UK

Develop an advanced, harmonized and science-based risk assessment framework for school infrastructure in Indonesia

Objectives

A. **A**ssess physical and social impact of **Earthquakes** and **Tsunami** on school buildings through new **ANALYTICAL** & **EMPIRICAL** fragility and **VULNERABILITY** models.

B. **I**nvestigate the enhancement of the multi-hazard resilience of schools through cost-effective, local **RETROFITTING MEASURES**.

C. **D**isseminate a culture of safe schools and safe communities through **TRAINING of Local Engineers, Regional WORKSHOPS** and **Disaster Risk Reduction EDUCATION**.

D. **D**evelop practical **Tools** for **DATA COLLECTION**, multi-hazards vulnerability prioritization/assessment, and demonstrate to case-study locations.

Future Research Collaboration

- Global Challenges Research Fund (GCRF) - UK Research and Innovation (UKRI)
  https://www.ukri.org/research/global-challenges-research-fund/

- Horizon 20-20; Erasmus+

Thanks so much for your time & attention!

Email: bayes.ahmed@ucl.ac.uk

Question?

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IRDR